TECHNOLOGY NEEDS/OPPORTUNITIES STATEMENT

IMPROVED, REMOTE, IN-SITU DETECTION OF STRONTIUM-90 IN GROUNDWATER

Identification No.: RL-SS09
Date: September 2001

Program: Environmental Restoration
OPS Office/Site: Richland Operations Office/Hanford Site
Operable Unit(s): 100-NR-2
PBS No.: RL-RC01 (RL-ER08)
Waste Stream: Groundwater (Disposition Map Designation: ER-10 [technical risk score 5] and ER-18 [technical risk score 5])
TSD Title: N/A
Waste Management Unit (if applicable): N/A
Facility: N/A

***Priority Rating*:**

This entry addresses the "Accelerated Cleanup: Paths to Closure (ACPC)" priority:

____ 1. Critical to the success of the ACPC
_X_ 2. Provides substantial benefit to ACPC projects (e.g., moderate to high lifecycle cost savings or risk reduction, increased likelihood of compliance, increased assurance to avoid schedule delays)
____ 3. Provides opportunities for significant, but lower cost savings or risk reduction, and may reduce uncertainty in ACPC project success.

***Need Title*:** Improved, Remote, In-Situ Detection of Strontium-90 in Groundwater

Need/Opportunity Category: Technology Need

***Need Description*:** Monitoring strontium-90 by discrete sampling is costly and time consuming. In situ monitoring is needed to reduce the labor-intensive process of sampling, handling, and shipping samples for analysis. Minimization or elimination of purge water production and associated disposal or treatment requirements is desired. In situ monitoring is also needed for situations where monitoring site access is difficult and costly, or where conditions may pose safety hazards to samplers. In situ measurement in extraction, injection or monitoring wells, well points, or in river substrate is needed to provide remote monitoring of contaminant concentrations. It is anticipated that in situ monitoring will be needed to support cost effective performance monitoring of plume remediation. In situ detection as a part of characterization is needed to provide highly accurate isopleths of contaminant concentrations to aid in fate and transport modeling and construction of remediation systems. In situ monitoring is also needed to support long term monitoring associated with long-term stewardship of the plume.

Schedule Requirements:

Earliest Date Required: 8/1/99

Latest Date Required: 9/30/30

Pump and treat operations are ongoing as an expedited action. An interim record of decision (ROD) was issued in 1999 selecting an interim remedy. The interim ROD includes a requirement to evaluate other technologies by FY04. Long-term monitoring will be required to support either pump and treat continuation or alternate technologies.

***Problem Description*:** The 100-N Area is located along the horn of the Columbia River in the northern portion of the Hanford Site and includes one nuclear reactor previously used for plutonium production. Maximum groundwater concentrations range from 4,000 - 6,000 pCi per liter. Depth to water table ranges from 60-80 feet at the source.

At present, concentrations of strontium-90 are measured by discrete sampling from wells or river substrate with analysis in analytical laboratories. Times for receipt of analytical results vary, but can extend to several weeks. Laboratory analytical work is highly accurate, but time delays and high cost associated with sampling labor are considered to be significant drawbacks. In addition to lowering costs, a new monitoring technology that allows measurements at multiple discreet depths within a well will provide for improved plume characterization, better estimates of contaminant inventory, enhanced understanding of plume migration and better remediation system design.

Benefit to the Project Baseline of Filling Need: An in situ technology would replace the use of laboratory analytical methods and field sampling. At present, these methods are producing satisfactory analytical results but are time consuming and expensive.

***Functional Performance Requirements*:** The new technology must measure contaminant concentrations in situ in extraction, injection or monitoring wells, well points, or in river substrate. Depth to water table is 60-80 feet with maximum ground water concentrations ranging from 4,000 - 6,000 pCi per liter. Results must be near real-time or on-demand and output must be transmittable by hardwire or telemetry to standard computer connections for data reduction and processing. In situ strontium-90 detection must be sensitive to less than 8 pCi/L. In situ detectors must be of robust design and capable of operating for long periods without maintenance in the specified environments. A technology able to make measurements at multiple discreet depths within a well to allow for vertical plume profiling is also desired.

Work Breakdown Structure (WBS) No.*:** 1.4.03.1.1.07.08.09.02 ***TIP No.: N/A

Relevant PBS Milestone: PBS-MC-029

***Justification For Need*:**

Technical: In situ measurement in extraction, injection or monitoring wells, well points, or in river substrate would provide real-time monitoring of contaminant concentrations. Combinations of horizontal and vertical profiling could provide highly accurate isopleths of contaminant concentrations to aid in fate and transport modeling and construction of remediation systems. In situ monitoring will also negate the present requirement of human samplers to purge wells, collect samples and transport to a certified laboratory, and dispose of waste.

Regulatory: There is no regulatory requirement for this technology need.

Environmental Safety & Health: There is no environmental safety and health issues of concern with this technology need.

Potential Life-Cycle Cost Savings of Need (in $000s) and Cost Savings Explanation:
The estimated life-cycle cost savings associated with filling this need is $2M. This estimate is based on an assumed savings of 30% of the current monitoring cost of $250K/yr over 30 years.

Cultural/Stakeholder Concerns: In situ monitoring could reduce the "traffic" around monitoring locations situated in or near culturally and environmentally sensitive areas.

Current Baseline Technology: Laboratory analysis.

Cost: Based on estimates of $1500 sample collection cost per well, $150 per sample analysis cost, and 146 wells sampled once per year, the annual costs for monitoring the Sr plume is approximately $240K per year. The monitoring duration depends on the final remediation strategy but may last for 280 years or more. Although there are no current baseline plans to fund extensive plume mapping, advanced characterization techniques that allowed near real time monitoring of plume concentration changes would be supported by the groundwater project.

How Long It Will Take: Beyond FY 2000.

End-User: Richland Environmental Restoration Project

Site Technical Point-of-Contact: Scott W. Petersen, BHI, (509) 372-9126; Jared D. Isaacs, BHI, (509) 372-9162; Michael J. Truex, PNNL, (509) 376-5461

Contractor Facility/Project Manager: Michael J. Graham, BHI, (509) 372-9179

DOE End-User/Representative Point-of-Contact: Arlene C. Tortoso DOE, (509) 373-9631